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Ontario Hydro.

HYDRO 21. OPTIONS FOR ONTARIO HYDRO. PRESENT SITUATION
AND OPTIONS FOR THE FUTURE. 1993.

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HYDRO 21 OPTIONS FOR ONTARIO HYDRO

Present Situation and Options for the Future

February 1993



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HYDRO 21

OPTIONS FOR ONTARIO HYDRO

CONTENTS

1. PRESENT SITUATION AND OPTIONS FOR THE FUTURE	1
HYDRO'S EVOLUTION	2
FUTURE ACTIONS	5
A. SHORT-TERM	5
B. LONG-TERM	6
2. UTILITY STRUCTURES TO MEET ONTARIO'S NEEDS	8
OPTIONS AND TRADE OFFS	9
A. ENERGY SERVICES	11
B. DISTRIBUTION	11
C. TRANSMISSION	12
D. GENERATION	12
E. OVERALL SYSTEM STRUCTURE	13
KEY QUESTIONS	14
3. PLANNING FOR FUTURE NEEDS	15
OPTIONS AND TRADE OFFS	16
A. INTEGRATION VS. MARKET	16
B. SHORT VS. LONG-TERM	16
C. LARGE VS. SMALL	17
D. TRADITIONAL VS. ALTERNATIVE TECHNOLOGIES	18
E. VOICE FOR PUBLIC	18
F. OTHER KEY ISSUES	19
KEY QUESTIONS	19
4. HOW SHOULD ELECTRICITY COSTS BE CHARGED TO CUSTOMERS?	20
OPTIONS AND TRADE OFFS	20
A. PRICING AND ENERGY EFFICIENCY	20
B. PRICING AND SUSTAINABILITY	21
C. PRICING AND ECONOMIC DEVELOPMENT	21
D. DISCOUNT RATES AND SURPLUS CAPACITY	22
E. PRICE BASED ON SERVICE, NOT KILOWATTS	23
F. DISCOUNT FOR LOW INCOME CUSTOMERS	23
G. REVIEW AND REGULATION	23
KEY QUESTIONS	24



1. PRESENT SITUATION AND OPTIONS FOR THE FUTURE

What made Ontario Hydro a successful utility in the 20th century will not be adequate for the 21st. This century's challenge was to provide cheap and reliable power to a rapidly growing Ontario.

Ontario Hydro grew in response to this challenge becoming one of the largest, most respected utilities in the world, and the most important single organization in Ontario's economy. In the last decade of the century, Hydro faces a very different, more complex, and difficult set of challenges as it works to enhance Ontario's ability to become a world-class, competitive, energy-efficient, and environmentally sustainable economy.

Hydro is now in the process of transition. It has initiated steps towards the fundamental changes that are necessary. But major changes which will radically transform the Corporation to meet the challenges of the 21st century have yet to come.

These changes will neither be decided nor achieved by Hydro alone. This paper is intended to initiate discussion between Ontario Hydro and its stakeholders about options for the future. But to know what changes are possible — and what constraints there are — we need to know something about how and why Ontario's utility system came to be.

HYDRO'S EVOLUTION

Ontario Hydro came into existence in 1906 as a result of public response to rapidly growing needs for electric power. Various economic, political and social factors came into play in determining the decision to opt for public ownership of the industry. At the time, urban centres were growing rapidly, and most gaslight, electric, telephone and transit services were provided by privately-owned companies. Some were monopolies, and poor service and high cost led both the public and business to support public ownership.

Cheap electrical power, it was realized, was vital to the province's future economic development. With the opportunity to develop massive hydro-electric power from Niagara Falls, Hydro was born as a self-regulating monopoly setting electricity rates based on power at cost.

For the next 60 years the demand for power climbed steeply and almost without interruption. Benefiting from heavy investments in newer and bigger generating stations and continual improvements in generating and transmission technology, Hydro expanded throughout Ontario and provided electrical service at a price which in real terms fell more or less continuously to the mid 1960s.

Demand doubled roughly every decade and was satisfied by building new hydro-electric stations until the mid-1950s, by which time the major hydro sites had been developed. Hydro then turned to coal-fired stations and, by the end of the 1960s, to nuclear stations.

The oil shocks of the 1970s pushed rates up dramatically. The rise in rates coincided with many concerns that are familiar today: concerns about diminishing resources, the environment, and the need for greater involvement by the public in planning stations and transmission lines which were visibly changing the world around them. Throughout the developed world, the 1970s marked the beginning of questioning the limits to growth, and the environmental and social tradeoffs associated with growth.

Oil shortages also focused attention on the need for conservation and more efficient use of energy sources. There was growing concern about the earth's ability to continue to sustain environmental depletion and damage. This in turn gave rise to questions about the nature of economic growth and the role of energy in relation to environmental sustainability.

A growing appreciation of the economic and environmental advantages of greater energy efficiency emerged. Using this efficiency, most



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customers could meet their needs while reducing the requirement for expensive new capacity, and more businesses could be competitive without degrading the environment. Using electricity more efficiently could result in a lower electricity bill on a continuing (sustainable) basis, and better conservation of the earth's resources.

By the end of the 1970s, about a third of Ontario's electricity came from nuclear stations, a third from coal stations, and a third from hydro-electric. Energy and conservation had become key issues on the public's agenda. Growth in demand slowed and Hydro stretched out its construction programs.

By the late 1980s, demand was picking up rapidly again, and Hydro responded by developing a 25-year plan, which was released in 1989. In 1990, the plan was submitted to the Environmental Assessment Board for review.

Although the plan incorporated conservation and energy efficiency improvements, it still forecast the possibility of substantial long-term growth in demand caused by sustained long-term economic growth. It proposed the purchase of power from Manitoba and private suppliers, as well as the construction of nuclear, natural gas, and hydro-electric stations.

Events overtook the plan, as the demand for electricity actually decreased because of the recession and Hydro re-examined some of its planning assumptions. Hydro recognized a need for a much more flexible approach to planning, and to pursue greater opportunities to respond rapidly and flexibly to change.

In 1992, Hydro revised the plan, drastically cutting back its request for approvals. In January 1993, it withdrew its application before the Environmental Assessment Board.

ONTARIO HYDRO PROFILE*

Annual Revenue	\$ 7.8 billion
Annual Costs	\$7.4 billion
Assets	\$46.6 billion
Debt	\$34 billion

HYDRO SELLS ELECTRICITY TO

311 Municipal Utilities serving almost
2,800,000 customers

925,000 rural retail customers

115 large direct customers

GENERATING STATIONS

69 hydro-electric, supplying 27% of our electricity

8 fossil-fuelled, supplying 21% of our electricity

5 nuclear supplying 49% of our electricity

- Purchases from others supplying 3% of our electricity
- 135,000 km of distribution and transmission lines.
- Winter peak demand — 22,000 MW (approx.)
- Hydro's dependable peak capacity 31,000 MW (approx.)
- Energy Management programs forecast to deliver over 2,200 MW by the year 2000, 3,800 MW by the year 2010.

RATE INCREASES

	NOMINAL	REAL
1991	8.6%	3.82%
1992	11.80%	10.17%
1993	7.9%	5.17%

**latest available figures*

FUTURE ACTIONS

A. SHORT-TERM

Ontario Hydro has a crucial role to play to help Ontario compete economically and to do so in an environmentally sustainable way. In the short-term, there is much to do and some of it will be painful. Recent rate increases partly reflect the impact of a powerful, but not unusual, business cycle, the cyclical downturn in economic activity. But Hydro was no more able than anyone else to predict the depth or extent of the recession.

A main consequence of these unforeseen conditions is increased electricity rates. But there are a number of other reasons for increased rates. Aging generating stations require more maintenance and the cost of new facilities being brought into service has begun to be reflected in the rates. Taken together, these factors have increased electricity rates over the last three years by 20% even after taking inflation into account. The higher electricity price comes at a particularly inopportune time, in the middle of Ontario's severest recession since the Great Depression and in spite of a low inflation rate.

This problem requires urgent measures. Hydro has already responded by taking some significant actions to reduce expenses. More than \$10 billion' worth of capital investments have been deferred or cancelled, including a long-term power purchase from Manitoba, and several hydro-electric developments.

All non-utility generation contracts that have not received final approval were put on hold until their need and value could be reassessed in light of the current oversupply situation. And planned 1993 operations, maintenance, and administration expenses have been reduced by roughly ten per cent.

A Hydro task force was directed to come up with an urgent plan to minimize near-term rate increases, and keep increases in the 1990s at or below the rate of inflation. These short-term initiatives are to be achieved in a way that is consistent with the long-term need to restructure Ontario Hydro for the 21st century.

B. LONG-TERM

Recent rate increases and declining demand may be an urgent short-term issue, but they also reflect the undeniable need for structural transformation of Ontario Hydro. Though there are short-term things that Hydro is doing, and more that it can do, such measures must take full account of global changes. Shifts in trade patterns, a changing dollar, and weak resource exports have cut demand for electricity and cut Hydro's revenues. They are all part of global patterns which will affect Ontario for years to come.

The expectations of customers have also changed. They want, as always, a reliable supply of electricity at a reasonable price. But they also want more. Hydro will have to be a leader in energy efficiency and competitiveness in a way that sustains economic development and protects the environment.

Hydro cannot decide alone what kind of company Ontario wants it to be and needs it to be. For this reason it is seeking public participation and partnership in laying out options for sustainable pathways for our future development.

A world which is using electricity more efficiently will also be a world in which growth of demand for electricity is moderated. Other things being equal, corporations and individuals which practice optimum use of resources and sustainability are more efficient — and therefore more competitive and financially healthy — than those which do not.

Let us look at the choices facing Hydro within the context of Ontario as a whole. It is widely accepted that Ontario must move away from its over-dependence on raw material exports towards an economy in which knowledge and technology will be the prime sources of added value and competitive advantage.

If it does not, Ontario could well face what used to be referred to as an "Argentina syndrome". It could become a resource-rich area unable to adapt to changes in international markets, failing to regain job losses in industrial and service sectors and forced to drastically down-size its social services and infrastructure expenditures as the tax base fails to support current programs.

If Ontario **does** achieve the transformation to a higher value added economy, a more optimistic scenario may be within reach — a more competitive manufacturing sector competing well internationally by as early as the year 2000.

The result would be greater efficiency in the service sector, pushing up productivity and helping the economy make the transition to more sustainable economic growth.

The emergence of a new Ontario Hydro will be important in determining which scenario comes closest to reality. Hydro has to help Ontario use electricity — and energy generally — better by providing better energy services and showing the way to inextricably connect efficiency and sustainability.

The possible emergence of new technology must also be counted as a powerful influence on Ontario's options. Hydro must ensure that future options encompass technological change as well as structural change. The development of fuel cells, for example, holds considerable promise for generating power and heat in individual buildings. Such developments could make it possible to generate much more electricity where it is used. This would have obvious and extensive effects on today's transmission and distribution systems.

The rest of this paper addresses some of the options before us, and the benefits and sacrifices that they imply. The overall question is **what sort of utility can best meet Ontario's needs for the 21st century?** The paper deals with this question under three headings:

1. What type of structures for generation, transmission, distribution, and energy services will best meet Ontario's needs?
2. What new resources should be used to meet electricity needs in the 21st century, and how should they be planned?
3. How can electricity costs be charged to customers in a way that will optimize competitiveness and sustainability?

2. UTILITY STRUCTURES TO MEET ONTARIO'S NEEDS

The electric power business consists of four basic components: generation, transmission, distribution and energy services.

- The **generation** system produces electricity from energy sources such as fossil fuels (coal, oil and natural gas), hydro-electric, and nuclear power. Alternative energy sources such as wind, solar, peat, and biomass have been utilized, but on a much smaller scale to date. Because the demand for electricity can vary greatly with time of day and with season, there must be sufficient capacity to meet the peak demand and there must also be a method of determining the order in which stations are brought on line ("dispatched"). Dispatch decisions can be influenced by cost, environmental and system considerations.
- The **transmission** grid is the far-ranging network of high-voltage transmission lines which carries electricity from the generating stations to the areas in which it is needed.
- The customer receives electricity directly from the retail **distribution** system. Distribution grids receive electricity from the high voltage transmission grid and distribute it at lower voltages to the individual customers in the cities, towns, or communities they serve.

- **Energy services** help customers lower their energy costs through such activities as energy conservation, energy efficiency, and fuel switching. Energy services have an increasingly important role in improving efficiency, which in turn helps economic competitiveness.

Ontario Hydro largely follows the traditional utility model. It is vertically-integrated in that it controls most generation and the transmission grid (under one organization). Hydro also acts as a distributor in serving some customers directly. However, most of Hydro's electricity is sold to municipal electric utilities which distribute electricity within their jurisdictions. Hydro supplies some energy services directly, but relies also on private companies to deliver the bulk of these services. Hydro is publicly owned and operates as a power pool where the benefits and costs of electricity supply are shared among users throughout the province.

Traditional integrated monopoly utility structures are being challenged in many parts of the world. The pressure comes from increasingly more competitive independent producers, decentralized generating technologies and more open, competitive markets.

In Ontario, recent rate increases have also led some municipal utilities and industrial customers to consider generating their own power, or purchasing it elsewhere, which challenges the premise that costs and benefits should be shared by all Ontarians throughout the province. In

addition, some groups have called for the breakup and privatization of parts of the corporation in the belief that the discipline of the marketplace will improve overall efficiency and effectiveness.

OPTIONS AND TRADE OFFS

What is a suitable structure for Ontario Hydro and Ontario's electricity system in the next century? Is the current system optimum, or would a modified or radically different system best meet Ontario's needs?

The electricity generation, transmission, and distribution system exists to serve the people of the province and a starting point is to judge options against criteria which reflect customer and community expectations of the system. Individual customers tend to be concerned about cost, reliability, flexibility and service.

Communities want good corporate citizenship, environmental protection, energy conservation, economic development, universality of supply, and community involvement.

No structure can achieve all of these equally. Preference for one structure over another will depend on the trade offs that society wishes to make, and has the resources to make. A system has to match the needs of the community it serves. It also has to take into account the infrastructure, economic climate, geographical extent, population density, and distribution system within which it operates.

A wide range of options is possible for each of the components of the electricity business. And there are also a range of options as to how the components might be linked to each other in the chain from generation to the consumer.

At one end of the spectrum of possible structures is the large vertically-integrated and centrally-coordinated utility, with monopoly powers in a given service area. At the other is a system of small, specialized, competing organizations which are only loosely connected. And, within this wide range, ownership may be public, or private or mixed.

The following table broadly indicates the range of possible structures for energy service, distribution, transmission, and generation. The structures of each component can be characterized in terms of the degree of private **ownership** and the extent of **competition** (as opposed to coordination).

In addition, it is possible to have a greater or lesser degree of **vertical integration** between each of these activities. For example, generation, transmission and distribution may all be part of the same corporation, or may be operated entirely separately.

OPTIONAL STRUCTURES FOR THE MAJOR COMPONENTS OF THE ELECTRICITY BUSINESS

ENERGY SERVICES	DISTRIBUTION	TRANSMISSION	GENERATION
• Public utility	• Arm of vertically-integrated utility (public or private)	• <i>Arm of vertically-integrated utility (public or private)*</i>	• Monopoly (public or private)
• Private utility	• <i>Local utilities (public or private)*</i>	• As above with Third- Party Access	• <i>As above with controlled non-utility generation access*</i>
• <i>Public or private utility plus energy service companies*</i>	• Local utilities with Third-Party Access	• Transmission company (regulated: public or private monopoly)	• Open and competitive market

* Current situation in Ontario.

Ontario market for electricity services about \$500 million annually.

\$300 million in private sector activities and \$200 million in Ontario Hydro incentives and programs.

Most of Ontario's electricity is sold to over 300 municipal electric utilities which re-sell it to about 2.8 million customers.

Hydro distributes directly to over 900,000 rural retail customers, and to over 100 large industrial customers.

Ontario Hydro has over 28,000 km of high-voltage transmission lines.

Ontario's grid is linked to neighbouring provinces and U.S. states.

Ontario Hydro operates 5 nuclear, 8 fossil-fuelled and 69 hydro-electric stations.

Ontario Hydro's 69 hydro-electric stations supply 27% of the total energy, 8 fossil stations supply 21% and 5 nuclear stations supply about 49%. Purchases from others, including non-utility generators, supply the remainder.

The structural options within each component of the business are as follows:

A. ENERGY SERVICES

Energy services are usually supplied by specialized private companies, often with the backing of incentives from the public sector and utilities. Both private and public utilities have embarked on energy services programs with encouragement from governments and regulators. The public-owned utility gains the long-term benefit of avoiding the need to build expensive new generation. In some U.S. jurisdictions, however, it has been found necessary to allow investor-owned utilities a short-term return on their energy management investment, otherwise there is little incentive for these utilities to support measures which reduce electricity demand and, therefore, revenues.

It is possible to imagine energy services companies being run by either a private or public utility. A private sector approach would require incentives and appropriate regulation. A mixture of public and private initiatives makes use of incentives by the public sector to kickstart the market for private suppliers.

B. DISTRIBUTION

Distribution is usually carried out by local or regional utilities which, in effect, have a monopoly franchise. Regulation of the rates they charge may therefore be required to avoid abuse of monopoly power. These utilities may be publicly or privately owned. Their size can vary greatly. Large regionalized distribution utilities

would likely exhibit greater economies of scale whereas smaller, localized utilities would be more likely to be responsive to the communities they serve.

Distribution may also be carried out by the arm of a large vertically-integrated utility. In some instances, there are no local distribution utilities and the vertically-integrated utility carries out all distribution. Hydro Quebec is an example.

Some jurisdictions are beginning to introduce competition at the retail level. Under this system the customer is free to buy from a supplier in another area. The customer's local utility is required by law to transmit, at a "fair charge", electricity from a rival supplier to the customer. This process is termed giving "**third-party access**" (TPA) to the rival supplier and is said to involve the "**retail wheeling**" of power.

Increased competition for customers may result in lower overall rates and more choices for consumers. Concerns have been raised, however, about the possibility of large customers or those in favoured locations benefiting more from increased competition than other customers.

In the longer term, technological developments such as fuel cells may allow the development of highly decentralized electricity and energy production, linked through a network only for the purposes of backup and supplementary power. This would represent a radical departure from present systems.

C. TRANSMISSION

Transmission, including the system to control and dispatch power when and where it is needed, is usually seen by economists as a natural monopoly, whether publicly or privately owned. Given current technologies, it makes little economic sense to duplicate the transmission network in a given service area. In addition, because supply must be matched minute-by-minute to demand, it is necessary to have a coordinated system for dispatch.

Access to the transmission system is therefore a key issue. In some jurisdictions, utilities are being ordered to act as a "common carrier" and allow third-party access (TPA) to outside producers. The objective of TPA in this case is often to make it easier for other producers to compete with the utility's own generation. TPA can involve the transfer of power to another utility ("wholesale wheeling", being introduced in the U.S.) and/or transfer of power to a particular customer ("retail wheeling", being introduced in the U.K. and Norway).

Increased competition in the generation sector as a result of TPA may result in greater efficiencies. However, operation and control of the electricity grid would likely become more complex. It may also increase the difficulty of maintaining transmission reliability, and of matching geographical patterns in transmission and distribution when demand patterns shift.

In markets which are moving towards more open competition, the transmission system is usually operated as a separate and distinct monopoly business which supplies transmission

services in response to requests from generators, distributors and large industrial or commercial customers. Because it remains a monopoly, the fees it charges for transmission services are usually subject to regulation.

D. GENERATION

Some utilities, both private and public, have exclusive rights to construct and operate generation facilities, and the corresponding obligation to ensure adequate and reliable supply. Though monopolies, they may allow independent power producers some access to the system. But this access is controlled to avoid the unnecessary duplication and overlap of supply.

Competition can be introduced into the generation sector. This may take various forms, including competition between generating stations within a utility, or between utilities and/or independent power producers. The introduction of a fully competitive generation market is facilitated by introduction of third-party access to transmission services as discussed earlier.

Where independent producers are being encouraged to compete with a utility, the timing of any introduction of further supply may be crucial. Introducing new supply when there is already a surplus may increase utility prices because fixed costs already incurred by the utility then have to be recovered over a smaller rate base. It is therefore most economically efficient to introduce increased competition from independent power producers when new generation is needed. Theoretically, in a fully competitive system, a surplus of supply could lead to lower prices.

E. OVERALL SYSTEM STRUCTURE

There are many ways of linking the energy services, distribution, transmission and generation sectors. There are also many ways that public and private ownership can be mixed.

Vertically-Integrated Monopoly: The vertically-integrated, monopoly utility structure (such as Ontario Hydro) maximizes economies of scale and facilitates integrated planning and operation. In return for monopoly rights, the utility assumes responsibility for ensuring long term supply and the obligation to serve all customers within the service area. While monopoly utilities remain under pressure to offer rates that are competitive with those offered elsewhere, they are shielded from direct competition.

Public utilities are often identified with government services which are seen by many to be unresponsive to customers, inflexible and inefficient. On the other hand, public ownership is seen to remove the profit motive and to increase the responsiveness of the utility to policy direction from the government to undertake activities viewed as enhancing the greater social good.

Privatization: Some publicly-owned utilities have recently been privatized (e.g. Nova Scotia Power and ENEL in Italy). Reasons seem to be to promote the influence of market forces over centralized decision-making and to pay down public debt. In the latter case the market value of the assets sold sometimes turns out to be very different from their book value.

Others have been private for decades, such as the large, vertically-integrated monopolies in the U.S., Germany and Japan. The prices charged by such utilities are usually regulated to prevent abuse of monopolistic power. These private utilities have provided reliable supply, but there appears to be no broad consensus that private ownership, by itself, leads to lower prices. Supporters of privatization argue that the private sector is generally more efficient than the public sector, while critics argue that having to pay dividends to investors tends to increase prices.

De-Integration (Unbundling): The structural ties between the generation, transmission, distribution and energy services arms of an integrated system may be loosened in order to establish competitive generation or distribution markets. For example, a utility could maintain control over the transmission system, but give others the right to generate electricity and to use the transmission system.

A further step in this direction is to break up integrated utilities into separate businesses, for example, into one transmission company and a number of competing generation and distribution companies as occurred in England and Wales. Such systems are relatively new and it is too early to judge reliably their success. They would be expected to exhibit a greater degree of system diversity and flexibility. Proponents also believe that the market-place is generally more effective at meeting customer needs than coordinated planning.

But long-term issues such as security of supply and price stability are still a concern. Moreover, the market alone may not adequately ensure sufficient investment in research and development, environmental protection and energy conservation. The mixed system might also be more difficult to regulate, resulting in different customers paying different rates ("winners and losers").

Internal De-Integration: An alternative approach exists where a utility might reduce the degree of internal integration with the objective of improving efficiency. For example, the generating arm of a utility and its energy service arm could become two separate, autonomous business units, possibly competing directly against each other. This approach leads to a clear separation of the costs of the individual parts of the system, thereby heightening awareness of duplication and cross-subsidization and increasing accountability. Internal "unbundling" might provide a means of retaining the benefits of integration, while at the same time introducing the discipline of more competitive and business-like behaviour.

Increased Integration: It is also possible to increase the degree of system integration. For example, Ontario distributes electricity through a network of over 300 municipal utilities, while in Quebec this is done directly by Hydro Quebec. There might be efficiencies and savings in integrating the distribution and transmission systems in Ontario even further. This could be done by eliminating or reducing the number of local utilities.

KEY QUESTIONS

1. How would increased private ownership in Ontario affect customer service, the price of electricity and the provincial debt load?
2. How would increased private ownership, competition and/or unbundling affect (a) the competitiveness of firms in Ontario, (b) energy efficiency, and (c) sustainable development (including environmental protection)?
3. How would increased vertical integration (as in Quebec, where Hydro Quebec controls all distribution without intermediary municipal utilities) affect quality of service and cost of electricity to individuals and communities? Does the present system involving over 300 municipal utilities result in inefficiencies?
4. Is it desirable overall to retain a public power pool with common prices and shared risks and benefits across the whole Province? Or should prices, risks, and benefits be determined regionally? What is the appropriate balance between the interests of individual communities and the interests of the province as a whole?
5. What is the optimal utility structure in the long term? Will the concept of a province-wide utility become obsolete given national and international trends towards more open and competitive markets and the liberalization of trade?

3. PLANNING FOR FUTURE NEEDS

As a public corporation, Ontario Hydro has an obligation to take action to ensure that the future electricity needs of the people of Ontario will be met. The question of how best to plan to meet future electricity needs is central to examining Hydro's options for the 21st century.

Like all utilities, Ontario Hydro has to forecast what the future electricity needs of consumers will be, and then decide how to meet those needs. Only three years ago, projections showed that there could be a shortfall of supply by the mid-1990s.

Hydro planned to rely first on energy management and efficiency improvements to reduce growth in demand, and then to buy power from independent producers. To meet remaining needs, Hydro planned to build hydro-electric, nuclear, and natural gas generating stations, along with importing power from Manitoba.

The plan went to Ontario's Environmental Assessment Board for review in 1990. It was a massive hearing. Business, community, environmental, consumer, and aboriginal groups questioned Hydro and performed studies and research. Over \$25 million in funding was awarded to over 30 groups to cover their costs for experts and participation in the hearing. Additional costs may be awarded at the end of the hearing.

Within two years the recession and increased plans for energy conservation by customers dramatically cut demand. Hydro adjusted its planning to the point where the requests for

approvals have been withdrawn, and the hearing under the Environmental Assessment Act terminated.

The events of the last three years have caused Hydro to rethink its approach to planning. Hydro's forecasts had identified uncertainty about future demand, and had indicated that future growth in electricity demand could range from very low to moderately high.

But Hydro's approach to planning made two key assumptions which were pivotal in Hydro's request for approvals. One was the decision to base planning on a 25-year horizon. This long span reflected the fact that Hydro wanted to continue to rely partly on large generating stations that take 12 to 14 years to approve, design, and build.

The other was the decision to plan and seek approvals based on high growth rather than low growth. That decision assumed that underplanning for new supply would leave the province worse off than overplanning it, i.e., that an oversupply of electricity was preferable to a shortage. It also assumed that the Corporation should not rely on options which can be put in place quickly should demand increase rapidly because these short lead-time options were thought to be more expensive than large generating stations.

The changing circumstances and shift in Hydro's approach to planning highlight some of the central issues in assessing planning options.

A surplus of generating capacity is now forecast for the next ten years. Planning must continue to address how to manage the surplus, how to deal with uncertainty, and how to meet future needs into the next century.

There are many approaches to planning, and choosing among them will have a major impact on the future of electricity in Ontario.

OPTIONS AND TRADE OFFS

A. INTEGRATED PLAN VS "LET THE MARKET DECIDE"

In many countries, there is a trend toward integrated resource planning. This means that the utility develops a comprehensive overview of resources, and identifies options to meet its needs. These options may include new stations, purchases from other utilities and independent producers, refurbishment or retirement of existing stations, and efficiency programs to reduce customers' needs for electricity. The options are evaluated together, aimed at getting maximum benefits for minimum cost. Those costs include:

- i. the utility's costs of supplying electricity and helping customers use it efficiently;
- ii. the customers' costs for making investments in more energy-efficient equipment; and
- iii. society's costs, which would include the environmental and health effects of producing or saving electricity. Because these costs are not now included in the cost of electricity, they are called "environmental externalities". Economists and planners are still struggling with how to calculate and use them.

An alternative to integrated resource planning is to let competition in the marketplace decide how future needs will be met. Different suppliers of electricity compete with each other for sales, ensuring that demand will be met. This has been done recently in England and Wales.

Each approach has its pros and cons.

Coordinated planning makes it easier for society to introduce policy direction into electricity planning. For example, it can promote renewable resources or develop some technologies rather than others. It probably provides a higher degree of certainty about future supply.

By contrast, a marketplace approach with a variety of competing suppliers is likely to be far more flexible and responsive to changes in the business environment. But there may be little market incentive for suppliers to "sell" conservation, since to do so would be to convince customers to use less of their product.

Based on experience, the market-oriented approach is also likely to lead to a greater use of smaller-scale, natural gas-fuelled generating stations rather than large capital-intensive technologies.

B. SHORT-TERM VS LONG-TERM PERSPECTIVE

A **long-term perspective** means that the costs of new generating stations can be paid back over 30 to 40 years. Technologies like hydro-electric and nuclear are capital-intensive — expensive to build, but with low fuelling costs. The long-term perspective allows the capital costs to be

recovered over an extended period, which reduces front-end costs, and allows benefits and costs to be traded off over long periods of time. This kind of investment in non-fossil-fuel technologies removes vulnerability to unforeseen escalation of oil or natural gas prices.

But there are downsides. The utility has to carry large fixed costs (depreciation and interest), which reduces flexibility to adjust to changes in economic conditions. There is also a risk that the power production from stations will turn out to be less than expected. This could happen if there are changes to safety or environmental regulations, or unexpected technical problems. Finally, there is the risk that better and cheaper technologies will come along and make the large investment less attractive.

At the other end of the spectrum is a **short-term perspective**. This favours relying on supply options with short lead times and short payback times.

One example is contracting to buy power from independent producers or from other utilities. Another is modular technologies like natural gas-fired turbine generators. This equipment is relatively cheap to acquire, and the cost of electricity it produces is highly dependent on the cost of the fuel to run it. The equipment can typically be installed in a year or two.

This approach doesn't lock the utility into major long-term cost commitments. Another advantage is that these options can be put into place

quickly, allowing quick response to sudden increases in demand. The downside is the risk of unexpected increases in fuel prices, and the long-term reliability of supply if fuel becomes scarce or prohibitively expensive.

C. A FEW LARGE STATIONS VS MANY SMALLER ONES

Ontario's electricity system is based mainly on **large centralized generating stations**. In the past, with electricity demand growing rapidly, this approach has had the advantages of economy of scale. Furthermore, pollution controls seemed easier to manage, since it seemed less costly to put controls on a small number of large stations than on a large number of small ones.

A **decentralized approach** would put smaller generators closer to where the electricity is used and reduce the need for transmission lines. It might also increase reliability because the power system would be able to draw on a larger number of stations.

The cost advantages of larger stations are declining. Smaller combined-cycle gas turbines have become more competitive with large coal and nuclear stations as long as gas prices remain low. With cogeneration equipment, gas can be burned locally to meet district needs for both heating and electricity. This can not only be economic but can also help the environment by getting the most use out of a non-renewable resource.

D. TRADITIONAL TECHNOLOGIES VS PROMISING ALTERNATIVES

Traditional supply options are hydro-electric, nuclear and natural gas or coal-fired generating stations. The strength of these technologies is their known reliability and costs, their commercial availability, and the infrastructure to acquire and operate them. This would also apply to gas-fired cogeneration equipment.

Alternative supply technologies such as solar, biomass and wind power have been uneconomic to date. But there could be technological breakthroughs, and the costs of traditional forms of generation have risen. Consideration of environmental or social costs and specific niche applications, such as solar panels on commercial buildings, may mean more rapid development of these options within the next 10 to 20 years. Fuel cells in particular show promise of becoming economic, and could help reduce dependence on centralized generating stations.

Demand side options address future demands for electricity by allowing customers to use electricity more efficiently, getting more from each unit of energy. These options also include programs to encourage electricity customers to use an alternative form of energy such as gas when it is more economic than electricity.

In integrated planning, measures to reduce growth in demand are treated on a similar basis as options to increase supply.

E. A VOICE FOR THE PUBLIC AND STAKEHOLDERS

At present, Hydro's plans to set rates, manage demand, and to build new facilities allow for public review through formal review processes. The Ontario Energy Board (OEB) reviews Hydro's rates annually, and the Environmental Assessment Board (EAB) deals with approvals for new Hydro lines or stations.

Hydro planning can be reviewed by the OEB, EAB or by government designated boards of inquiry or review committees. These mechanisms offer the public a voice and access, but they come at the tail end of the planning process, once plans have been submitted for review or approval.

More intensive public involvement earlier in the planning process can lead to better understanding, acceptance and support. It offers Hydro an opportunity to integrate public views into planning assumptions and evaluation criteria. This then provides a broader foundation for comparison of alternative options and plans. Such a process is more likely to result in preferred options which have a greater level of overall support. For controversial issues, where full consensus is often difficult to achieve, the public involvement process can help to distinguish areas of common ground from those unresolved issues that can be more comprehensively examined in a formal review setting.

Alternative dispute resolution mechanisms have been used with some success in the U.S. Parties agree to work together to obtain consensus on as many areas as they can. Issues that can't be resolved go to the regulator for decision. If mutual trust and a will to work together can be built, this process has some potential to reduce the length of formal public reviews.

The timing of public reviews is also an issue. Reviews initiated by Hydro only every few years give the utility more flexibility to develop comprehensive long-term plans. They run the risk of being too inflexible to respond to planning changes. Regular reviews bring public input to the planning process on an incremental basis.

F. OTHER KEY ISSUES

Other questions arise in utility planning. For example, should a utility pay incentives to customers to use less electricity when there is a surplus of power? Or should energy efficiency still be encouraged because it helps customers be more efficient in the long term, and improves their competitiveness?

Natural gas is a non-renewable resource. How does its use relate to sustainability? With gas prices being low, should this opportunity be exploited through more independent power purchases or through some direct actions that Ontario Hydro could take?

KEY QUESTIONS

1. Should demand and supply be balanced by an integrated utility plan or by market forces?
2. Should future new supply be provided primarily by capital-intensive technologies or through technologies using natural gas?
3. Are we prepared to pay now for energy conservation, environmental controls, conserving non-renewable resources, and rehabilitating stations to help ensure benefits in the future?
4. Should environmental and social externalities be recognized or quantified in electricity planning?
5. Should private generators be subject to the same kind of environmental assessment approvals as Hydro projects?
6. What's the best way for the public to voice its views on utility planning?

4. HOW SHOULD ELECTRICITY COSTS BE CHARGED TO CUSTOMERS?

Electricity rates in Ontario are based on the costs to produce and distribute it. **Rate levels** are determined by the need to recover all costs, plus some additional income to attract capital and retain some financial flexibility.

Rate structures are designed for each customer class (residential, commercial, industrial) so that each pays its fair share of the overall cost of service. The more than 300 municipal utilities set their own rates (subject to Ontario Hydro approval) based on the cost of the power they buy (mostly from Ontario Hydro) plus their local distribution costs.

The underlying philosophy and a current legal requirement of "power at cost" is that rates must pay for costs. In other words, Hydro couldn't sell power at less than the cost of producing it. The public utility approach at Hydro has been that costs must be spread fairly among customers, and treat equals equally.

The reason that there can be different rate classes is that different types of customers incur different costs to serve them. For utilities and large industrial customers, there are time-of-use rates to reflect the different costs of producing power at different times. Most smaller customers pay on a declining block structure, where there is a set charge (to recover service costs) for the first block of power, and a lesser charge for additional energy purchased. Hydro is also experimenting with Real Time Pricing, a refinement of time-of-use rates, where prices vary by time to more closely track actual system

costs. Both rate levels and rate structures are reviewed annually by the Ontario Energy Board.

Ontario Hydro's residential rates are typically much less than that of European and Pacific rim countries, and slightly less than those in the U.S. (where variations are considerable). Ontario rates are higher than the Canadian average. Industrial rate comparisons with the U.S. using standard rates show that Hydro ranks among the lowest. However, some U.S. industrial customers are able to negotiate discounts.

Rates generally affect how much, when, and why customers use electricity. Attempts to restructure the way costs are recovered basically hinge on three questions:

Who benefits?

Who pays? and

Do certain customers deserve special treatment?

OPTIONS AND TRADE OFFS

A. PRICING AND ENERGY EFFICIENCY

The way electricity is priced today averages the relatively cheap power from older stations with more expensive power from new ones. Some critics claim that this sends the wrong price signal to customers because additional power demands which require the construction of new facilities are usually more expensive to serve. Pricing based on these costs, known as marginal costs, would match new demand to the costs of new power. Strictly speaking, these marginal costs should also include external and environmental costs to society that are caused by additional electricity supply.

There are barriers, however. Marginal costs are difficult to define, and can fluctuate depending on whether new supply is needed, and if so, on what basis it should be costed. For example, marginal costs in today's surplus situation would be less than average costs. There is also a question whether moving to marginal costing for electricity would encourage energy efficiency if other competing fuels like natural gas were not also priced on the same basis.

The Ontario Energy Board decided in the 1970s that rates should be based on average accounting costs, rather than on the incremental cost of new facilities. The Power Corporation Act at present requires that Hydro recover its costs on this basis.

B. PRICING AND SUSTAINABILITY

There is a link between efficiency and sustainability. Using electrical power efficiently reduces a customer's consumption and reduces overall bills as well as environmental impacts associated with new facilities.

A full-fledged approach to sustainability means that pricing would include all external costs associated with the production and delivery of electricity. For example, the costs of air pollution damage, greenhouse gases, health, social and environmental impacts of natural gas production, uranium mining and disposal, and nuclear and hydro-electric risks, would have to be included in electricity costs.

Such a strategy would have to assume that prices for all other resources would also include full environmental and social costs so that consumers' choices would produce an optimal path for environmental sustainability.

Rates under marginal cost pricing, especially if they included externality costs, would certainly rise. What impacts would this have on customers' bills? Customers able to implement efficiency measures would reduce their consumption. Other customers, particularly industries struggling to compete, might not be able to afford to implement marginal cost pricing, at least not in the short term.

But, at the same time, there would be increased revenues resulting from these externality charges. This revenue could help customers implement efficiency improvements. If the externality approach were applied to the cost of other products in the marketplace as well, a form of tax relief might be possible.

C. PRICING, ECONOMIC DEVELOPMENT AND DISTRESSED INDUSTRIES

One view of sustainable development, as it applies to Ontario, is that the financial health of our key industries must be restored. How could electricity pricing contribute to this goal? Many industries have been vocal on this point.

Some industrial customers have expressed concern about Hydro's "one-size-fits-all" approach when special rates or contracts are often negotiated by their competitors in U.S. utilities. Industries faced with increasing electricity rates might shut down, move south, produce their own power, or buy from private producers.

Ignoring these concerns during this time of surplus would result in further loss of revenue to Hydro and pressure to increase rates for those who remain on the system.

Hydro's rates could be "**customized**" to help industry develop or, in some cases, just survive through a difficult period. This helps the utility in two ways. First, it brings in additional revenue through increased sales. Second, it avoids revenue losses that would occur if customers go out of business, move, or cease to buy their power from Hydro.

What form could customization take? There are a number of approaches. A customer's rate increases could be fixed over a defined period of time. Rates could be indexed to the market price of the customer's product. The customer could be offered a declining series of discounts that return the customer to standard rates over, say, five years.

Such pricing agreements could be done through individually negotiated contracts, or through standardized rates with published schedules and eligibility criteria.

Individual contracts have the advantage of meeting individual circumstances, but there are disadvantages too. One is determining need. Is the discount really needed, and if so, what is the right amount? Could the contract be defended publicly, or would other customers wonder if everyone is being treated equally? One option would be for customers to put their case before the Ontario Energy Board or some other third party.

Making special rates available to all through **published criteria** might reduce any perceptions of discrimination. But eligibility rules would have to be carefully designed to screen out "free riders" — those who would have, and could have, paid standard rates.

Another issue is whether special rates to industry would reduce customer incentives to install more energy-efficient equipment. Perhaps efficiency improvement could be made a condition of receiving developmental or distressed industry rates.

D. DISCOUNT RATES AND SURPLUS CAPACITY

With surplus capacity, the costs of supplying additional power is lower than our average costs. This could be taken as an opportunity to discount rates in supporting business development.

There is the issue of how promoting electricity use is consistent with energy efficiency and sustainable development goals. Conditions might be attached to the kind of applications that the discounted power could be used for, e.g., the production of efficiency improvement or environmental control products.

There is also the possibility of attracting free riders.

E. PRICES BASED ON SERVICES, NOT KILOWATTS

Pricing for energy services would entail unbundling traditional electricity supply services. It would offer new energy-related services and expanded rate options. Such a strategy could see utilities metering and billing for hot water, comfort control, motor power, lighting, etc. This would likely mean moving from a cost-recovery approach based on the kilowatt-hour to market or value-based pricing for such services.

Such an approach might support improvements in efficiency and lower rates. However, it might also place at a disadvantage those with little market power, leading to calls for at least some limited forms of price regulation.

F. DISCOUNT FOR LOW INCOME CUSTOMERS

Social welfare pricing could provide low income families with affordable rates by pricing initial consumption at a low rate, and subsequent blocks of power at a higher rate.

U.S. experience shows, however, that low income families are not necessarily low users of electricity, so the benefits may not be going to the intended group. Furthermore, for benefits to be substantial the low-priced block would have to be large, meaning that the pricing signal would not be contributing to energy efficiency.

G. RATE SETTING, REVIEW AND REGULATION

Hydro's rates are currently set by Hydro's Board of Directors, appointed by the Provincial Government. Although it must have annual rate increases reviewed in a public hearing by the Ontario Energy Board, Ontario Hydro has the responsibility to set its own rates. Another option is to have Ontario Hydro rates regulated by the Ontario Energy Board.

The current OEB review process influences Hydro's rate-setting, but regulation would formally shift the rate-setting authority to another body.

Regulation of Hydro's rate levels would likely result in more direct third-party control of Hydro's planning and operations decisions insofar as rate increases resulting from those decisions could be denied.

In the case of municipal utility rates, Hydro currently acts as regulator. The "partnership" between Ontario Hydro and municipal utilities may suggest that this role is no longer appropriate.

One option is for municipal utilities to become self-regulating. An alternative is to have them regulated through a public process. The large number (300+) of utilities involved might make public regulation too cumbersome to implement.

Changes in utility structures, including private ownership and/or structuring for increased competition could have implications for the review and regulation of rates.

KEY QUESTIONS

1. Should rates continue to be based on a cost-recovery basis, with all customers paying their full share of utility costs?
2. Should rates be set to ensure affordability of basic service and/or to promote industrial development?
3. Should rates be used to penalize specific uses of electricity in the interests of resource allocation or environmental protection?
4. How should affordability and competitiveness considerations be addressed in promoting energy efficiency and sustainable development?
5. Should we alter rate levels or structures to reflect external costs, or continue to reflect only actual costs incurred as a result of utility operations?
6. Should Ontario move to a market-oriented treatment of rates, with utilities free to offer individual pricing agreements with customers and customer groups?
7. Should Ontario Hydro continue to set its rates, or should they be set by some other body?

